CLAIMS

What is claimed is:

1. An audio power amplifying apparatus including first through B-th power amplifying terminals, each of which power-amplifies an input alternating current (AC) audio input signal and outputs a power amplified result as an audio output signal, wherein a b-th amplifying terminal ($1 \leq b \leq B$) comprises:

a preamplifier that divides the audio input signal into positive and negative portions, preamplifies the positive and negative portions, and outputs the preamplified positive and negative portions;

a power supply to supply first through M-th positive and negative voltages having different levels;

a power amplifier that selects one of the first through M-th positive supply voltages having a level proportional to a level of the preamplified positive portion and one of the first through M-th negative supply voltages having a level proportional to the level of the preamplified negative portion, amplifies the preamplified positive and negative portions using the selected one of the positive and negative supply voltages, respectively, and outputs the amplified positive and negative portions; and

a signal synthesizer that combines the amplified positive and negative portions output from the power amplifier and outputs the combined result as the audio output signal.

2. The apparatus of claim 1, wherein:

said power amplifier comprises:

first through M-th current amplifiers that are connected in series to each other and which are supplied with the first through M-th positive voltages, respectively,

M+1-th through 2M-th current amplifiers that are connected in series to each other and which are supplied with the first through M-th negative voltages, respectively; and,

first through 2M-th resistors that are connected in series with each other between the preamplified positive and negative portions,

the m-th current amplifier is biased in response to a voltage at a first node between the m-1-th resistor and the m-th resistor to amplify a current output from the m-1-th current amplifier and to output the amplified current to the m+1-th current amplifier, where $2 \leq m \leq M-1$,

the M+m current amplifier is biased in response to a voltage at a second node between the M+m-1-th resistor and the M+m-th resistor to amplify a current output from the M+m-1 current amplifier and to output the amplified current to the M+m+1-th current amplifier,

the first current amplifier is biased in response to a voltage at a third node between the first resistor and the preamplified positive portion,

the M+1-th current amplifier is biased in response to a voltage at a fourth node between the M+1-th resistor and the preamplified negative portion,

the M-th current amplifier is biased in response to a voltage at a fifth node between the M-1-th resistor and the M-th resistor to amplify a current output from the M-1-th current amplifier and to output the amplified current to the signal synthesizer as the amplified positive portion, and

the 2M-th current amplifier is biased in response to a voltage at a sixth node between the 2M-1-th resistor and the 2M-th resistor to amplify a current output from the 2M-1-th current amplifier and to output the amplified current to the signal synthesizer as the amplified negative portion.

3. The apparatus of claim 2, wherein each of the first through 2M-th current amplifiers comprises:

a first transistor having an emitter, a base connected to a bias input port, and a collector connected to a corresponding one of the positive and negative voltages,

a 2M+1-th resistor, one side of which is connected to the emitter of the first transistor, and

a second transistor having a base which is connected to the emitter of the first transistor, a collector connected to the collector of the first transistor and an emitter which is connected to another side of the 2M+1-th resistor.

4. The apparatus of claim 3, wherein:

said power amplifier further comprises:

a first diode having an anode and a cathode coupled to the third node and a bias input port of the first current amplifier, respectively,

a second diode having a cathode and an anode coupled to the fourth node and a bias input port of the M+1-th current amplifier, respectively, and

third through 2M-2-th diodes, wherein the m+1-th diode has an anode and a cathode coupled to the first node and a bias input port of the m-th current amplifier, respectively,

and the M+m-1-th diode has a cathode and an anode coupled to the second node and a bias input port of the M+m current amplifier, respectively.

5. The apparatus of claim 4, wherein:

said power amplifier further comprises 2M-1-th through 4M-4-th diodes,

an x-th diode has an anode and a cathode coupled to the x-2M+3-th positive voltage and output of the x-2M+2-th current amplifier, respectively, where $2M-1 \leq x \leq 3M-3$, and

a y-th diode has a cathode and an anode coupled to the y-3M+4-th negative voltage and output of the y-2M+3-th current amplifier, respectively, where $3M-2 \leq y \leq 4M-4$.

6. The apparatus of claim 5, wherein the b-th power amplifying terminal further comprises a third transistor having a base connected between the M-th resistor and the 2M-th resistor, and a collector and an emitter connected between the fifth and sixth nodes.

7. The apparatus of claim 6, wherein:

said signal synthesizer comprises 2M+2-th and 2M+3-th resistors connected in series to each other between the amplified positive and negative portions output from the M-th and 2M-th current amplifiers, respectively, and

the audio output signal is output from between the 2M+2-th and 2M+3-th resistors.

8. The apparatus of claim 1, wherein said preamplifier changes an amplification factor in response to the audio output signal output from said signal synthesizer.

9. An audio power amplifying method performed by a b-th power amplifying terminal ($1 \leq b \leq B$) of an audio power amplifying apparatus including the first through B-th power amplifying terminals, each of which power-amplifies an input alternating current (AC) audio input signal and outputs the power amplified result as an audio output signal, the method comprising:

dividing the audio input signal into positive and negative portions and to preamplify the positive and negative portions and to obtain the amplified positive and negative portions;

selecting one of first through M-th positive supply voltages having a level proportional to a level of the preamplified positive portion;

selecting one of first through M-th negative supply voltages having a level proportional to a level of the preamplified negative portion;

amplifying the preamplified positive and negative portions using the selected one of the positive and negative supply voltages, respectively; and

combining the amplified positive and negative portions to produce the audio output signal.

10. A power amplifying apparatus to amplify an input signal to be output as an amplified signal, comprising:

a splitting unit that splits the input signal into signal portions;

a power supply to supply voltages;

an amplifier to match ones of the signal portions with corresponding ones of the supply voltages and to amplify the signal portions using the corresponding supply voltages; and

a signal synthesizer to receive the amplified signal portions and to combine the amplified signal portions as the amplified signal.

11. The power amplifying apparatus of claim 10, wherein said splitting unit splits the input signal into a positive signal portion and a negative signal portion.

12. The power amplifying apparatus of claim 10, wherein said amplifier matches the ones of the supply voltages that are proportional to the corresponding ones of the signal portions.

13. The power amplifying apparatus of claim 10, wherein said splitting unit further amplifies the input signal.

14. The power amplifying apparatus of claim 13, wherein said splitting unit amplifies the input signal in accordance with the amplified signal output from said signal synthesizer.

15. The power amplifying apparatus of claim 11, wherein:

said power supply supplies positive and negative supply voltages of different values, and

said amplifier amplifies the positive signal portion using one of the positive supply voltages that is proportional to the positive signal portion, and amplifies the negative signal portion using one of the negative supply voltages that is proportional to the negative signal portion.

16. The power amplifying apparatus of claim 15, wherein:

said amplifier further comprises current amplifiers, each of which is connected to a corresponding one of the positive and negative supply voltages,

the positive signal portion is amplified using one of the current amplifiers that is connected to the one of the positive supply voltages that is proportional to the positive signal portion, and

the negative signal portion is amplified using another one of the current amplifiers that is connected to the one of the negative supply voltages that is proportional to the negative signal portion.

17. The power amplifying apparatus of claim 16, wherein the remaining ones of the current amplifiers do not amplify the positive and negative signal portions.

18. The power amplifying apparatus of claim 17, wherein the current amplifiers are connected in series with each other and each of the current amplifiers is a circuit in a Darlington configuration.

19. A power amplifying apparatus to amplify an input signal to be output as amplified signals to different devices, comprising:

an input terminal to receive the input signal; and

power amplifying terminals to receive the input signal from said input terminal and to output amplified signals to the different devices,

wherein each said power amplifying terminal comprises

a splitting unit that splits the input signal into signal portions,

a power supply to supply voltages,

an amplifier to match ones of the signal portions with corresponding ones of the supply voltages and to amplify the signal portions using the corresponding supply voltages, and

a signal synthesizer to receive the amplified signal portions and to combine the amplified signal portions as the amplified signal to be output to the corresponding one of the different devices.

20. The power amplifying apparatus of claim 19, wherein each of the amplifiers matches the ones of the supply voltages that are proportional to the corresponding ones of the signal portions.

21. The power amplifying apparatus of claim 20, wherein each of the splitting units further amplifies the input signal in accordance with the amplified signal output from the corresponding signal synthesizer.

22. The power amplifying apparatus of claim 19, wherein:

each of the power supplies supplies positive and negative supply voltages of different values, and

each of the amplifiers matches one of the positive supply voltages that is proportional to the positive signal portion, and matches one of the negative supply voltages that is proportional to the negative signal portion.

23. A power amplifying method comprising:

dividing an input signal into signal portions;

selecting a first supply voltage from a plurality of supply voltages such that the first supply voltage has a level proportional to a level of a first signal portion of the signal portions;

selecting a second supply voltage other than the first supply voltage from the plurality of supply voltages such that the second supply voltage has a level proportional to a level of a second signal portion of the signal portions;

amplifying the first signal portion using the selected first supply voltage;

amplifying the second signal portion using the selected second supply voltage; and

combining the amplified first and second signal portions to produce the output signal.

24. The method of claim 23, further comprising preamplifying the input signal prior to said selecting the first and second supply voltages.

25. The method of claim 24, wherein said preamplifying the input signal comprises adjusting a level of preamplification in accordance with a level of the output signal.

26. The method of claim 23, wherein said dividing the input signal into signal portions comprises dividing the input signal into a positive portion and a negative portion.

27. A power amplifying apparatus to amplify an input signal to be output as an amplified signal, comprising:

a power supply to supply voltages of different levels; and

an amplifier that linearly selects one of the supply voltages having a level proportional to a level of the input signal and to amplify the input signal using the selected one of the supply voltages to be output as the amplified signal,

wherein said amplifier selects the one of the supply voltages without using a comparator.